Claims

1. A prosthetic knee joint mechanism comprising first and second knee parts which are rotatable relative to each other in joint flexion and joint extension, and a load-activated knee-stabilising device for resisting joint flexion, the stabilising device comprising means defining a fluid-filled fluid displacement chamber associated with the first knee part and a piston which is connected to the second knee part so as to be driven by rotation of the second knee part relative to the first knee part and which is so arranged within the chamber that it divides the chamber into first and second variable volume chamber parts which are interconnected by a fluid passage, the stabilising device further comprising a valve associated with the fluid passage and including a valve member which is movable between an open position in which fluid can flow through the passage to allow joint flexion and a stabilising position in which such fluid flow is at least restricted, wherein the valve member is movable towards its open position in response to fluid pressure in the interconnecting passage upstream of the valve member caused by application of a flexion torque to the knee joint mechanism, and wherein the stabilising device includes a weight-responsive valve control arrangement to at least resist movement of the valve member in the direction of its open position.

2. A mechanism according to claim 1, wherein the displacement chamber is in the first knee part and is centred on an axis of relative rotation of the first and second knee parts, and the piston is a rotary piston which rotates with the second knee part.

3. A mechanism according to claim 1 or claim 2, wherein the valve comprises a main valve in which the valve member is movable in a fluid-filled valve cavity, and wherein the control arrangement comprises a weight-responsive pilot valve forms part of a secondary fluid passage which communicates with the valve cavity for hydraulically resisting movement of the valve member of the main valve in the direction of its open position.

4. A mechanism according to claim 3, wherein the main valve comprises a shuttle valve having an upstream port opening into the valve cavity on one side of the valve member, a downstream port located in a wall of the cavity so as to be at least partially covered by the valve member in its stabilising position and in communication with the upstream port via the valve cavity when the valve member is in its open position, and a control port opening into the valve cavity on the other side of the valve member, the control port forming part of the secondary passage.

5. A mechanism according to claim 3 or claim 4, wherein the main valve includes a bleed passage interconnecting portions of the valve cavity on opposite sides of the valve member.

6. A mechanism according to claim 5, wherein the bleed passage is located in the valve member.

7. A mechanism according to any preceding claim, including means for biasing the valve member towards its stabilising position.

8. A mechanism according to claim 7, wherein the biasing means comprises a spring.

9. A mechanism according to any preceding claim, including a yield adjuster in the form of an adjustable stop defining the stabilising position of the valve member.

10. A mechanism according to any of claim 9, when dependent on claim 5, wherein the adjustable stop is arranged to close the bleed passage at least partially when the valve member is in its stabilising position.

11. A mechanism according to any of claims 3 to 6, wherein the secondary fluid passage provides fluid communication between the valve cavity of the main valve and that part of the fluid displacement chamber which increases in volume with joint flexion.

12. A member according to any of claims 3 to 6 and 11, wherein the pilot valve includes a plunger spring-biased towards a closed position.

13. A mechanism according to any of claims 3 to 6, 11 and 12, wherein the said first knee part is configured as a shin-associated component or a thigh-associated component and is divided into a pair of resiliently interconnected elements one of which contains the fluid displacement chamber, the interconnected elements being arranged to execute a weight-responsive relative movement, and wherein the pilot valve is so arranged in the said first knee part that it opens and closes in response to relative movement of the resiliently interconnected elements.

14. A lower limb prosthesis including a knee joint mechanism according to any preceding claim.

15. A prosthesis according to claim 14, wherein one of the knee parts is associated with or is constituted by a shin component of the prosthesis, and the other of the knee parts is associated with or is constituted by a thigh component of the prosthesis, and wherein the said axis of rotation is the knee axis of rotation of the prosthesis.

16. A prosthesis according to claim 15, wherein the first and second knee parts are associated with or constituted by the shin component and the thigh component respectively.

17. A prosthetic knee joint mechanism comprising a piston in a fluid-filled fluid displacement chamber, the mechanism being arranged such that the piston and the chamber resist joint flexion in response to weight activation, wherein the mechanism includes: a valve associated with a fluid passage interconnecting parts of the chamber on opposite sides of the piston, the valve having a valve member movable in response to upstream fluid pressure in the passage from a stabilising position, in which fluid flow in the passage is restricted, to an open position, in which fluid is allowed to flow more freely; and a weight-responsive valve control arrangement to resist movement of

the valve member in the direction of its open position thereby to cause the mechanism to resist flexion.

18. A mechanism according to claim 17, wherein the piston and the displacement chamber, which is of circular configuration, are centred on an axis of relative rotation of two parts of the mechanism which rotate relatively to each other in joint flexion.

19. A mechanism according to claims 17 or 18, wherein the valve control arrangement comprises a pilot valve in fluid communication with a fluid-filled valve cavity housing the said valve member, the mechanism being configured such that the pilot valve closes in response to weight-activation thereby to prevent movement of the valve member in the direction of its open position.

20. A mechanism according to claim 19, wherein the valve in the interconnecting passage between opposite sides of the piston includes a bleed passage allowing restricted fluid flow between parts of the said valve cavity on opposite respective sides of the valve member, the valve member being resiliently biased towards its stabilising position.

21. A mechanism according to claim 19 or claim 20, comprising a shin-associated portion and a thigh-associated portion which rotate relatively to each other in joint flexion and joint extension, one of which portions is divided into resiliently interconnected parts arranged to execute a weight-sensing movement relative to each other, wherein the pilot valve is mechanically operable by such relative movement.

22. A prosthetic knee joint mechanism comprising first and second knee parts which are rotatable relative to each other about an axis of rotation in joint flexion and joint extension, and a load-activated knee-stabilising device for resisting joint flexion, the stabilising device comprising means defining a fluid-filled displacement chamber associated with the first knee part and a piston which is centred on the knee axis of rotation and connected to the second knee part so as to be driven by relative rotation between the knee parts, and which is so arranged within the chamber that it divides the

chamber into first and second variable volume chamber parts which are interconnected by a fluid passage, the stabilising device further comprising a valve associated with the fluid passage and including a valve member which is movable between an open position in which fluid can flow through the passage to allow joint flexion and a stabilising position in which such fluid flow is at least restricted, wherein the valve member is movable towards its open position in response to differential fluid pressure on opposite sides of the valve member caused by application of a flexion torque to the knee joint mechanism, and wherein the stabilising device includes a valve control arrangement substantially to eliminate the said differential pressure when the joint mechanism is loaded.

23. A mechanism according to claim 22, wherein the valve member is resiliently biased towards its stabilising position.

24. A lower limb prosthesis having a shin component and a thigh component which are rotatable relatively to each other in joint flexion and joint extension, and including a knee joint mechanism as claimed in any of claims 17 to 23.

25. A prosthesis according to claim 24, when dependent on claim 18, claim 22 or claim 23, wherein the shin and thigh components are rotatable relatively to each other about a fixed knee axis of rotation, and wherein one of the said mechanism parts is associated with the shin component and the other of the said knee mechanism parts is associated with the thigh component, the said mechanism parts being rotatable relatively to each other about the knee axis of rotation.

26. A prosthesis according to claim 25, wherein the fluid displacement chamber is associated with the shin component and the piston is associated with the thigh component.

27. A prosthetic joint mechanism comprising first and second joint parts which are rotatable relative to each other in joint flexion and joint extension, and a joint-stabilising device comprising means defining a fluid-filled fluid displacement

chamber associated with the first joint part and a piston which is connected to the second joint part so as to be driven in the chamber by relative rotation of the joint parts, the stabilising device including an hydraulic valve controlling the flow of fluid to and/or from the first displacement chamber; wherein the valve comprises a valve member which is movable between an open position and a closed position in a valve cavity in response to an external force on the valve member, the cavity having an inlet port at least indirectly in communication with the fluid displacement chamber, and an outlet port which is closed by the valve member when in the closed position, the valve member being resiliently biased towards the closed position and having a piston part located in a bore which opens into the cavity on an opposite side of the cavity from the outlet port, and wherein the effective sealing area of the said piston part in the bore is greater than the effective sealing area of the valve member at the outlet port, whereby the valve member is caused to move away from its closed position in the event of pressure in the cavity caused by an excessive flexion moment applied to the joint mechanism.

28. A joint mechanism according to claim 27, wherein the valve is a pilot valve arranged to control operation of a main hydraulic valve which is located in a primary hydraulic passage between parts of the fluid displacement chamber on respective opposite sides of the piston.